DOCUMENT RESUME

ED 380 116 IR 055 216

TITLE	Humanities and Arts on the Information Highways: A Profile. Final Report.
INSTITUTION	American Council of Learned Societies, New York, N.Y.; Coalition for Networked Information.; Getty Art History Information Program, Santa Monica, CA.
PUB DATE	Sep 94
NOTE	50p.
PUB TYPE	Reports - Descriptive (141)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	*Access to Information; Cultural Background; *Fine Arts; *Humanities; *Information Networks; Natural Language Processing; Reports; *Telecommunications
IDENTIFIERS	*Digitizing; Information Superhighway; Machine Vision; National Information Infrastructure

ABSTRACT

A National Initiative has been formed to address the urgent need for the humanities and arts to gain a voice in the planning and development of the National Information Infrastructure (NII). This report makes a case for the importance of connecting all people with electronic access to the nation's cultural heritage, and relates the special challenges and opportunities associated with digitizing humanities and arts information to the administration's "Agenda for Action for the National Information Infrastructure." The initiative profile includes a discussion of: public benefits of the humanities and arts in the information age; necessary components of a humanities and arts information infrastructure; community response to the profile report; and next steps. The report also summarizes the findings of the National Initiative's two working groups on technical requirements and electronic resources. It is contended that the technological research and investment required to bring the complex resources of the humanities and arts into digital form and to make them accessible would contribute profoundly to the most difficult technological challenges of our age: machine understanding, machine vision, and natural language processing. Five appendices include: "Important Computer-Based Projects in the Humanities and Arts"; "Sponsors of the National Initiative"; "Working Group on Technical Requirements"; "Working Group on Electronic Resources"; and "Advisory Meeting Participants (July 14, 1994)." (MAS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 380 116

Humanities *and* Arts *on the* Information Highways

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

A Profile

Final Report
September 1994

A National Initiative sponsored by

The Getty Art History Information Program

The American Council of Learned Societies

The Coalition for Networked Information

"PERMISSION TO REPRODUCE THIS MATERIAL IN **OTHER THAN PAPER COPY** HAS BEEN GRANTED BY

Susan L. Siegfried

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)"

IR055214

BEST COPY AVAILABLE

Humanities *and* Arts
on the Information Highways

A Profile

September 1994

A National Initiative sponsored by

The Getty Art History Information Program

The American Council of Learned Societies

The Coalition for Networked Information

This working report was developed by the Getty Art History Information Program (AHIP), an operating program of the J. Paul Getty Trust, as a joint project with the American Council of Learned Societies and the Coalition for Networked Information.

Use of this material is permissible with acknowledgment to the sponsoring organizations.

Humanities and Arts on the Information Highways

Contents

Preface 1

A Profile

Introduction 7

Public Benefits of the Humanities and the Arts in an Information Age 9

Necessary Components of a Humanities and Arts Information Infrastructure 15

Community Response to the Profile Report 23

Next Steps 25

Working Group Reports

The Technical Challenge for the Humanities and Arts 29

Investing in Humanities and Arts Information Resources 35

Appendices

A. Important Computer-Based Projects in the Humanities and Arts 43

B. Sponsors of the National Initiative 47

C. Working Group on Technical Requirements 49

D. Working Group on Electronic Resources 51

E. Advisory Meeting Participants (July 14, 1994) 53

Humanities and Arts on the Information Highways:
A National Initiative

Preface

Humanities and Arts on the Information Highways: A National Initiative has been formed to address the urgent need for the humanities and arts to gain a voice in the planning and development of the National Information Infrastructure, the much-publicized plan for a national telecommunications system.

The initial sponsors of the National Initiative -- the Getty Art History Information Program (AHIP), the Coalition for Networked Information (CNI) and the American Council of Learned Societies (ACLS) -- are joining with other stakeholders to confront the issues and responsibilities connected with bringing the nation's cultural heritage into the digital environment.

The report makes a case for the importance of providing all people with electronic access to the nation's cultural heritage, and relates the special challenges and opportunities associated with digitizing humanities and arts information to the administration's *Agenda for Action for the National Information Infrastructure*. The report also summarizes the findings of the National Initiative's two working groups on Technical Requirements and Electronic Resources.

Community response to the report was elicited at a special meeting of strategic organizations in the cultural heritage community on July 14, 1994, in Washington, D.C. Appendices C-E to the report reflect the immense institutional and individual expertise brought to bear on these issues.

The final report is scheduled for publication in conjunction with the release of *Putting the Information Infrastructure to Work*, Vol. 2, prepared by the Clinton administration's Information Infrastructure Task Force, Committee on Applications and Technology. This *Profile* is intended to complement and inform the administration's chapter on arts and humanities. It is our hope that the arts and humanities community will use the *Profile* report as a guide for responding to the administration's call for comment on its applications paper.

Having sketched the shape of the problem and the steps which must be taken, the National Initiative will proceed to an expanded campaign of advocacy and action.

■ ■ ■ ■

A brief history of the National Initiative

On January 17, 1994, the Executive Committee for *Humanities and Arts on the Information Highways: A National Initiative* met to plan the next steps needed to gain a voice for the humanities and the arts in the development of the National Information Infrastructure (NII). The group agreed on a number of action items. The sponsors of the Initiative -- the Getty Art History Information Program (AHIP), the Coalition for Networked Information (CNI) and the American Council of Learned Societies (ACLS) -- convened two working groups to develop a profile of humanities and arts computing in the United States. These working groups gathered a nationwide array of experts in scholarly, instructional and creative computing in order to draw a picture of the breadth and vitality of technology as it was now being applied to the humanities and arts.

The Working Group on Technical Requirements was asked to define the special technical challenges of humanities and arts computing. The Working Group on Electronic Resources surveyed the computer-based information and tools for networking already available and currently in development for transmission on the networks. The findings of these working groups were presented in July to a national meeting of major organizations and institutions involved in humanities and arts computing in America.

The goal of this process is to reinstate the humanities and arts in the dialogue shaping public policy on electronic telecommunications. The sponsors understand that the recognition and support of the Clinton-Gore administration, and other public and private interests, are crucial if the special needs of this vital community are to be met. Only a coordinated National Initiative can secure a future for the American people's cultural heritage in the digital environment, and guarantee the network as a medium of creativity and learning.

The National Initiative had been launched at a meeting held in conjunction with the CNI on November 19, 1993, when a group of 25 concerned leaders in the movement to automate humanities and arts information produced the following statement of purpose:

> The absence of the humanities and arts in the development of a national information infrastructure ignores the value of the American people's cultural heritage, and the network as a medium of creativity and learning, in the crucial formation of technology policy.
>
> The members of the Task Force for Humanities and Arts on the Information Highway: A National Initiative endorse the principle that humanities and arts voices are critical -- indeed equal to the recognized

interests of the sciences -- in the balanced development of the nation's technological infrastructure.

Reinstating the humanities and arts in the dialogue shaping this public policy is of utmost urgency. We call for the reintroduction of the humanities and arts in the formation of such policy.

The Task Force agreed on the following goals:

- Defining a rubric that articulates the value of humanities and arts computing for a democratic society.
- Building a profile of humanities and arts computing using data that identifies the breadth and vitality, as well as the needs, of technology in these fields.
- Forming alliances with identified stakeholders in order to engage in national policy development and planning.

■ ■ ■ ■

A Profile

Humanities and Arts on the Information Highways:
Introduction

The NII is at the center of an American information revolution that will profoundly affect the ways in which we communicate, learn, work, and govern ourselves. The nature of a democratic society requires an educated, and informed, citizenry. Information is not only a keystone of democracy but also one of the nation's most critical economic resources. Information is an educational, research, and creative asset accumulated by past generations, invested for the future. Electronic technologies have the potential to transform information from a scarce, inequitably distributed and fragmented commodity into a true public good, one that is virtually inexhaustible as well as perpetually renewed and expanded.

Humanities and arts computing has significant contributions to make, not only to the content of the NII, but also to advances in technology that will drive its development. The technological research and investment required to bring the complex resources of the humanities and arts into digital form and to make them accessible would contribute profoundly to the most difficult technological challenges of our age: machine understanding, machine vision and natural language processing. The creation of a fully interactive and exploratory environment essential for the arts and humanities to thrive would transform the NII from a link between computers to a connection between people.

Undercapitalization of the impressive array of exciting projects already underway, and technological barriers that require concerted research, are impairing the ability of these communities to meet the challenges and realize fully their contribution to the dawning electronic age. A national policy that encourages humanities and arts endeavors will allow for cultural heritage information to contribute toward the promises of the NII and enable the scientific and engineering communities to reap the benefits of research on humanities-driven technology problems.

Public Benefits of the Humanities and the Arts in an Information Age

Reshaping humanities and arts information for distribution over electronic networks can provide many dividends, among them the following:

- Enriching a sense of community through active participation in a networked environment.
- Improving the quality of teaching, and the learning of critical thinking, visual literacy, and analytical skills.
- Fostering intellectual and artistic collaborations that will result in new resources in the arts and humanities.
- Preserving the full complexities and quality of cultural information for the use of future generations while making it accessible to more people today.

If the NII were to offer access to everything found in the nation's libraries, museums, theaters, auditoriums, and archives, it could help dissolve the boundaries that now separate communities, social classes, people of different economic levels, the highly educated and the broad public, and the peoples of different nations. Networks and new multimedia formats for information can reverse current inequities in access to resources. Some resources that broaden such access already exist, such as these:

- The Global Jukebox, a multimedia database that provides audio, video and textual information on international music, dance and cultural traditions across time and geography. The Global Jukebox, funded by the National Science Foundation (NSF), among others, provides a research and teaching resource for anthropologists, ethnomusicologists, dance and theater historians, and sociologists as well as for choreographers, composers and other creative artists.
- Save Outdoor Sculpture (SOS), a national inventory effort to catalog outdoor works of public art, jointly sponsored by the National Museum of American Art, the Smithsonian Institution, and the National Institute for the Conservation of Cultural Property.
- The Making of America: 1860-1960, a project initiated by Cornell University to preserve a significant record of our national

heritage as digital images and to make those materials available on the Internet.

- Variations, a project at Indiana University's Music Library, that provides an online listing of music resources worldwide, and also serves as a testbed for the application of emerging technology to the distribution of digital audio and full-motion video across networks.

- The Perseus project, which brings the world of Greek classical antiquity to the public's fingertips through images, literary texts, historic documents and maps, published on interactive compact disc (CD-ROM) and videodisc by Yale University Press.

Electronic networks are unparalleled teaching tools, making research findings, educational materials and original sources available to any teacher and any student. Examples of just a few of the projects currently online and in development demonstrate this potential:

- The National Geographic Society's Kids Network provides students in grades 4 through 6 an opportunity to participate in a telecommunications-based science and geography curriculum where they can investigate new ideas and exchange information with students around the world. This network allows students in all 50 states and 38 countries to collect information and draw conclusions from data exchanged electronically.

- Direction Paris and Dans le Quartier St. Gervais, housed the Massachusetts Institute of Technology (MIT) Laboratory in the Humanities in the Department of Humanities and the Center for Educational Computing Initiatives, are multimedia interactive language teaching programs.

- The American Founding Fathers Project and the Packard Humanities Institute are digitizing the unedited manuscripts of Franklin, Adams, Washington, Madison and Jefferson to produce a CD-ROM that will be distributed to public libraries.

- The Cleopatra Project, being developed by the Art Institute of Chicago on CD-ROM, will relate objects through an information matrix and high-resolution images. This multidimensional teaching resource will have the capacity to view multiple sides and details of objects and connect the works to related illustrations of maps, photographs and other illustrations.

Networks can facilitate artistic or scholarly collaboration, lowering the barriers posed by geography and specialization. Some examples are interactive fiction writing done in Storyspace, or the collaborative forum for poets provided by Poet-L. The electronic highway has created new "virtual" public spaces, such as the bulletin board dialogues that PacerForum makes possible, where communication, debate, exhibitions and other novel forms of electronic interaction occur.

Interpretation, discovery and experimentation in the arts and humanities can be enormously quickened and expanded by electronic networks. Conference papers, for example, become accessible immediately, instead of many months after the event. Publishers already use the Internet to circulate electronic catalogs of new titles. University presses have begun experimenting with the electronic distribution of scholarly journals, and trade publishers are investigating the custom-tailoring of classroom texts for specific audiences. Examples of specific projects in this area are the following:

- H-NET, an international initiative, is a collection of lists of affinity groups (listservs) specifically for historians that is operated on a voluntary basis by scholars in the United States, Canada, Australia and Italy. With the financial support of the National Endowment for the Humanities (NEH), and hosted by the University of Illinois at Chicago, H-NET sponsors 37 electronic scholarly discussion groups with a rapidly expanding list of more than 10,000 subscribers who communicate research, teaching methods, analytical approaches and shared interests. Each list features topical dialogues, and publishes book reviews, job announcements, syllabi, bibliographies, guides to online library catalogs and archives, and reports on new software, data sets and CD-ROMs.

- Pre-press networks in philosophy, economics, communications and philology provide early access to scholarly conference papers.

- Humanist is the longest-running listserv for humanities scholars, while Arts Wire offers a range of services to artists and arts organizations.

- TULIP, an acronym for The University Licensing Project, is a three-year project being conducted by Elsevier Science Publishers and nine university library systems. It provides online versions of all project titles and a total of 42 serial titles to review. The information in this project will be used to answer technical, service and marketing questions relating to the creation, delivery and use of current, core science journals in online form.

Projects such as the MicroGallery of the National Gallery (London), distributed on CD-ROM, demonstrate that the entire holdings of museums and archives -- not merely what can be displayed at any one moment -- could be available as both visual and text catalogs. In addition, records referring to works, artifacts and texts now physically scattered in separate collections can be brought together in electronic databases, as is being done in the following projects:

- The Leonard Bernstein Archives Project, undertaken by the Library of Congress, a consortium of institutions across the country, and the Leonard Bernstein estate, to digitize electronic facsimiles of letters, scores, books and audio recordings that constitute the archive of this composer, musician and educator.
- The Census of Antique Art and Architecture Known to the Renaissance, an electronic archive that reconstitutes Renaissance sketchbooks, texts and drawings dispersed in museums and libraries around the world.
- The Global Jewish Database, an online database containing a collection of material for scholars of Jewish history and culture.
- The Thesaurus Musicarum Latinarum (TML), an evolving database, centered at Indiana University-Bloomington, that will eventually contain the entire corpus of Latin music theory written during the Middle Ages and the early Renaissance.
- The Provenance Documentation Collaborative, a consortium that has amassed inventories and sales records of works of art from European archives and auction catalogs.

These projects, and the many others like them, form the building blocks of national data sets in the humanities and arts (see pp. 16, 36). What is missing is the greater cooperation, both national and international, needed to avoid duplication of effort and to ensure that resources can be adapted to global networks. Such coordination stands to improve not only the understanding of American culture in foreign countries, but also Americans' appreciation of their own cultural heritages.

Attention to the automation of these resources into national data sets could open new markets for America's cultural wealth. The United States holds masterpieces from many civilizations and societies as well as the unique riches of Native American artifacts. The worldwide market for cultural heritage information is, on balance, a trade asset to the U.S. Networked information also generates a positive synergy; the more people have access to it, the more people will use it and find new uses for it, thus attracting more users. In addition, stimulated demand will lower costs.

Humanities and arts computing also has a unique contribution to make to the technical achievements of the NII. The technical challenges posed by assembling cultural heritage information in electronic form will offer complexities of a different order from the sciences.

If the potential benefits of the information revolution are to be realized, the humanities and the arts will need to make vital contributions. At the moment, financial under-capitalization, technological underdevelopment, and political neglect combine to hinder their doing so. The sections that follow describe the specific steps that must be taken if the humanities and arts are to occupy their rightful place on the information highway.

Necessary Components of a Humanities and Arts Information Infrastructure

The NII Agenda for Action identified the following five basic components of a national information infrastructure (NII Agenda for Action, September 15, 1993, p. 5):

- The *physical facilities* used to transmit, process, display and store data (voice, text, images).
- The *information* itself, in the form of scientific, scholarly or business databases, video programming, images, sound recordings, library archives and other media.
- The *software* programs (also known as *applications*) that allows users to access, manipulate, organize and digest proliferating masses of information.
- The *network standards and transmission codes* that allow networks to connect with each other, and that also ensure reliability, user privacy and the security of information.
- The *people* who create the information, develop applications and services, construct facilities and train others.

These components, or requirements, apply to all participants in the information infrastructure, whether in the sciences or the arts and humanities, whether in manufacturing, health care or electronic commerce. The section that follows assesses the current progress made by humanities and arts computing in these five areas (making allowances for the great disparities that currently exist among institutions, disciplines and individuals in these fields).

Physical Facilities

University- and college-based programs in the humanities and arts have invested substantially in acquiring and installing all kinds of computer equipment. Faculty offices usually have a desktop workstation as virtually standard equipment (though not necessarily connected to the Internet); students typically have access to computer labs and computerized library catalogs, perhaps from their dormitory rooms. Together, these university-based investments in equipment have laid a basic, if low-powered, foundation of facilities for an information infrastructure serving the humanities and the arts.

Nevertheless, the promise of universal access is far from a reality. While the investment in physical facilities has been significant, many inequities exist, both between campuses and within any given campus. These gaps are likely to continue, if not worsen, as technological

improvements in the quality and multimedia capabilities of equipment make access to more than basic facilities necessary. Now, as technological advances improve capacity, expand applications and link computers to other forms of communication, universities and colleges will need to continue to upgrade their physical facilities. Indeed, the acquisition, maintenance and upgrading of physical computing facilities will be particularly crucial for the arts and humanities, where the complex form of such information requires sophisticated equipment and technical improvements in visual, audio and text representation.

In addition, what has been missing until very recently is the consciousness of the paramount importance of interconnectivity: each college, university and university system has proceeded independently in acquiring its computer facilities and equipment, which were operated primarily on a stand-alone basis. Now, in the age of networks, institutions of higher education face a set of "last mile" or even "last foot" interconnectivity problems: that is, while a campus, or a library, or a single department may have the necessary equipment or network connection, not all faculty, administrators or students will necessarily have full access to these resources. In an era of constrained budgets, many institutions of higher education will be hard pressed to find the financial resources to meet these evolving needs.

Cultural institutions outside higher education often lack the most basic computer facilities. By contrast, university-affiliated museums, libraries, arts centers, and archives can take advantage of their institution's investments in information facilities and access to networks. For example, according to the Museum Computer Network (MCN), it is not uncommon for museums to regard non-administrative computing facilities as unnecessary unless funded by outside grants or required to meet a specific project or legal need. As a consequence, many museums have not established institutional computing facilities (SPECTRA, Vol. 21, No. 4). While exhibition planners could use interactive multimedia tools to reach and engage more museum visitors, and provide better resource materials for scholarship and classroom use, the necessary equipment is likely to be beyond the means of most such institutions.

Even for fully automated cultural institutions, interconnection to the Internet may be unavailable or costly if acquired through commercial service providers. Indeed, such large museums as the Metropolitan Museum of Art and the National Gallery of Art in Washington have no access to Internet services on a gallery-wide basis (SPECTRA, Vol. 21, No. 4). This situation is probably true of virtually all of the 15,000 museums, historical societies and archives in the United States as well.

The same deficiencies characterize many local arts and performing arts organizations, relatively few of which are fully computerized, and some of which lack even basic computer equipment. Communication networks in the arts are still uncommon, though participation in services such as Arts Wire have risen dramatically in the past few years. Certainly many artists, particularly those who are not institutionally affiliated, do not own or have access to

networked personal computers, and are thus excluded from a medium that they might find has intense creative potential for them.

Information

While electronic networks are certainly communication-rich, at present they are relatively content-poor, especially for researchers in the humanities and arts: an enormous amount of work remains to be done to convert the riches of our arts and cultural heritage information to electronic form. Without a critical mass of information, technological capacity is a hollow structure, like a library without books.

In the sciences, the newest information is the most valuable; historical information plays a distinctly secondary role to current documentation. In the arts and humanities, ancient archival materials are as valuable as modern. Materials accumulated over centuries -- manuscripts, texts, plays, maps, dance notation, sound and video recordings, drawings, paintings, sculpture, and artifacts of all kinds, as well as catalogs of all these materials -- are awaiting transformation into digital form. Such conversions will be enormously costly, because they must be undertaken at the highest possible quality levels so that the expense of successive re-digitizing can be avoided as technology improves.

The Brittle Books initiative of the National Endowment for the Humanities aims to preserve and improve access to 3 million brittle books through a nationwide effort over the next 20 years. The value to scholars and others of such improved access would be even further enhanced were the content of this significant corpus made available across the global Internet. Other projects aiming to increase access to humanities and arts resources include bibliographic, indexing, and object registration databases of long standing, which have been online for several years, such as the MLA Bibliography, the Avery Index to Architectural Periodicals, and the National Museum of American Art's Inventories of American Painting and Sculpture. Still others, such as the Art & Architecture Thesaurus (AAT) and the Library of Congress' National Coordinated Cataloging Operation (NACO), standardize the vocabulary prevalent in humanities and arts information. If such standards efforts were extended and adequately funded, they could become the building blocks for national cultural heritage databases. They would provide the integrating terminology needed to enable hundreds of individual and institutional projects to combine in a fully accessible digital resource of popular interest and educational value.

While the list of such projects is long and varied -- with generous support from NEH and NEA manifest in many cases -- it is still a cacophony of individual efforts, unguided by any systematic plan. What is needed are the vision and the funds to convert these separate projects into broadly based national data sets in the humanities and arts. A few model projects that have established a coordinated data collection process include the following:

- Inter-University Consortium for Political and Social Research (ICPSR). Hosted at the University of Michigan, the ICPSR is supported by funds from the NSF and by over 300 American and Canadian universities as well as national memberships in Europe, Latin America, and elsewhere. It maintains an archive of more than 30,000 data sets in the social sciences derived from surveys, censuses and administrative records. Of these, 1,000 are available over the Internet, and others will be added as additional disk space and documentation is prepared.
- American and French Research in the Treasury on the French Language (ARTFL), a database containing the French national literary corpus the Trésor de la Langue Française with works from the 17th to the 20th century.

It is not that the federal government fails to recognize the value of national data collection efforts; substantial support is currently provided for the creation of national data sets in the sciences. In fiscal year 1995, for example, the federal government plans to spend $152 million on the Human Genome Project, the creation of a database of our biological heritage, and (including investment from the private sector) $231 million for the Global Climate Change and Biological Diversity Documentation initiatives. Over the next decade, the federal government will commit many billions of dollars to these and other scientific projects. It is not unreasonable to ask for a similar level of commitment toward building national data sets recording our cultural heritage.

Government support for national data sets in other countries might provide models for similar support in this country. Many cultural databases, such as The Network of European Reference Corpora (NERC); the Oxford Text Archive; EuropArt; and the Network of Art Research Computer Image Systems in Europe (NARCISSE) are being developed in Europe, evidently because Europeans have come to recognize the research value of cultural databases and are discovering that their cultural information can have economic value as well.

Software Applications

Digitizing the centuries of existing humanities and arts information will be a long, expensive process that will only be worthwhile if it is built with an eye toward anticipated use and accompanied by software applications and tools that make possible a new dimension of learning and experience.

Burgeoning numbers of users can, for example, already participate in dialogues carried on within listservs; circulate journal articles for peer review with ease; and collaborate on

research projects with geographically separated colleagues. Examples of promising tools include the following:

- Mosaic, a browsing mechanism containing graphics and hypertext links (developed at the National Center for Supercomputer Applications at the University of Illinois at Champaign-Urbana), which allows a user to navigate the Internet with relative ease.
- Textual Analysis Computing Tools (TACT), a collection of programs for textual analysis which allow scholars to examine their materials in diverse ways.

At the same time, the field is wide open for the development of new tools geared to the needs of network users of cultural heritage information. Some examples of needed new tools include:

- Authoring tools suited to the production and exploration of content in the humanities and arts.
- Shareable libraries of software tools.
- More sophisticated navigational tools to replace today's rudimentary ones.

Needs in this area are detailed further in the document of the Working Group on Technical Requirements, in the second section of this report.

Network Standards and Transmission Codes

Standards and transmission codes are the most daunting of all the challenges the developers of global information networks face. The sheer newness and immense size of electronic networks means that standards for many different functions had to be invented nearly overnight, among them encryption for data security; log-on permission; recordkeeping to permit billing for the use of copyrighted material; and network management. This will continue to be true of such standards as data structures, coordinated vocabularies and many more.

Since electronic networks are global communication structures, network standards are by definition problems of the *whole*. Although different groups of organizations (computer firms, utility companies, federal contractors) assume responsibility for developing discrete parts of the total set of standards/transmission protocols, all work must be informed by a keen awareness of what all other groups are doing if the network is to function at all.

Technical committees of the International Organization for Standardization (ISO) and, in this country, the Institute of Electrical and Electronics Engineers (IEEE) have responsibility for regulating the development of network standards and transmission codes. Because the approval process is cumbersome, companies may publish a new standard and begin using it as they wait for it to make its way through the process. Yet the imperatives of global communication are so great that no proprietary standard could survive if it ignored the interconnectivity requirements of the network as a whole.

Another characteristic of network standards and transmission codes is that standards are in constant evolution as technological advances make new applications possible. Twenty years ago, as the earliest network protocols were being fashioned for use on the ARPANET, it was not envisioned that computer networks would ever be capable of carrying real-time video and that therefore a new protocol (asynchronous transfer mode, or ATM) based on entirely new principles would be required for such transmission to occur satisfactorily.

The network standards discussed above are defined as information interchange standards. Data standards are other criteria which, though not peculiar to the networked environment, protect the long-term value of the data stored in electronic databases, and make the transitions from one form of hardware or software to another easier when technological improvements dictate changes in equipment.

Standards for the content of our cultural heritage must accommodate the special characteristics of humanities and arts information manifested in all media of expression. The global nature of the humanities and arts favors the definition of open standards arrived at by broad consensus of an international community, reflected in ongoing efforts such as:

- The Text Encoding Initiative, an international project sponsored by the Association for Computers and the Humanities, the Association for Computational Linguistics, and the Association for Literary and Linguistic Computing with support from the NEH, the University of Illinois at Chicago and Oxford University, which has created guidelines for Standard Generalized Markup Language (SGML)-based encoding and interchange of machine-readable texts.

- The Art Information Task Force (AITF), a group representing the concerns of scholars, museum professionals and information specialists that has established a comprehensive set of categories for the description of works of art. Their work has in part been funded by an NEH grant to the College Art Association.

- The Consortium for the Computer Interchange of Museum Information (CIMI), a not-for-profit and for-profit private sector consortium that is working with

museums and information networks in the Unites States, Canada and Europe to define application protocols for the interchange of museum data. CIMI grew out of a NEH-funded project to enable museums to exchange data between systems.

- The Image and Information Standards Initiative, sponsored by the Getty Art History Information Program, which is identifying issues in imaging that require collective solutions and standard approaches. Among these issues are the vexing problems of developing guidelines for access to intellectual property and frameworks for project management for the ever-growing universe of digitization projects.

Many similar large-scale standards development efforts, and much education and assistance in the implementation of common methods, will be required before humanities and arts information will be widely available. Nevertheless, it is only through such content and application standards that the information so much desired for cultural enrichment can be made available and usable.

People

People create information, develop applications and services, train others to navigate available data resources, and are the ultimate contributors to and users of the electronic network. These crucial processes were first begun as individual scholars, librarians and artists became interested in demonstrating the potential of networked information to their communities. Now professional organizations have begun efforts not only to educate their members but also to represent their interests in policy debates. Professional associations in the humanities and the arts have an important role to play, by:

- Providing forums for discussing standards and priorities, as well as identifying items for policy action.
- Disseminating information (e.g., by producing directories), collecting statistics and evaluating current programs and practices.
- Articulating how improvements in electronic resources would serve the public.
- Sponsoring research into user behavior and the development of educational materials.

Just as professional associations have focused the efforts of individuals wishing to provide leadership in demonstrating the potential of networked information to their audiences, a center created to coordinate the efforts of a large number of professional associations could in turn provide an even greater leveraging effect.

Clearly, training in the use of the information highway will be a persistent concern. Not only will every American soon need basic training in electronic literacy, but specialized training and periodic refreshers will be needed as new resources and technologies appear. One model for such specialized training and software evaluation is currently provided by the Center for Electronic Texts in the Humanities (CETH) based at Rutgers and Princeton Universities. To say that such training will be the joint responsibility of schools and government, parents and teachers, business and the nonprofit sectors means that each segment of the economy will undoubtedly pursue its own agenda: employers will provide training in the hopes of increasing employee productivity; profit-making firms will educate potential users about the benefits of their electronic products. Coordination (or at least acknowledgment) of the aims of the various types of training available will ensure that training in the humanities and the arts is not neglected because these fields offer less obvious or immediate economic benefits.

Community Response to the Profile Report

In order to strengthen its arguments for a voice for humanities and arts in the National Information Infrastructure (NII), sponsors of the National Initiative distributed a draft of this report to strategic organizations and institutions in the cultural heritage community. The primary focus of this feedback was a meeting, on July 14, 1994, at which representatives of more than 40 humanities- and arts-related organizations assembled to consider the *Profile* report (Appendix E). Appendices C-E reflect the immense institutional and individual expertise brought to bear on these issues by representatives from museums, libraries and archives, colleges and universities, learned societies, foundations and government agencies.

The sponsoring organizations and the Executive Committee of the National Initiative outlined their purposes in convening the National Initiative, and summarized the reports of the two working groups on Technical Requirements and Electronic Resources. David Lytel, Information Infrastructure Specialist from the Executive Office of the President of the United States, was invited to explain the current planning process for the National Information Infrastructure. He described the administration's model for the NII, whereby users will be both creators as well as recipients of information services, a model conducive to the inclusion of the arts and humanities.

Discussion at the July 14 meeting and subsequent responses from the constituent communities affirmed that the Profile accurately and succinctly portrayed the landscape of technology and electronic resources in which the arts and humanities find themselves today. Important additional observations were made, including the following:

- The arts and humanities account for a great many jobs; they are important in economic as well as cultural terms.

- Moving cultural materials into the digital environment poses unusual and sophisticated intellectual and technical challenges, the solutions to which will benefit users of the NII in a broad array of other fields and applications, including commercial ones. Giving full attention to the arts and humanities in developing the NII will help ensure U.S. leadership in developing information technology.

- Broad electronic access to the nation's cultural heritage will be vital for ensuring the accountability of government and the continuing health of democracy in the United States.

- The digital cultural heritage must include materials from the full panoply of this nation's and the world's peoples, and include both materials from the past and

works and programs currently being produced by artists, musicians, scholars, writers and others.

- Arts and humanities organizations must continue their active involvement in discussions of the public policy issues currently before Congress, including telecommunications reforms, copyright, and federal support for arts and humanities projects and institutions.

Publication of the Profile of Humanities and Arts on the Information Highways will both complement and draw further attention to the considerable work being done by the Clinton administration to integrate the humanities and arts into NII planning and development.

Next Steps

The three initial sponsors -- the Getty Art History Information Program, the Coalition for Networked Information, and the American Council of Learned Societies -- are committed to continuing the National Initiative. Preparation of this report is the first key step in an agenda for action; subsequent key steps include the following:

- Articulating the public benefits of making the humanities and the arts full contributors to the NII in order to educate policymakers, decision-makers at standards-setting bodies and funding agencies, private-sector developers and potential users.
- Advocating the creation of a critical mass of cultural heritage information in digital form -- the content of the arts and humanities on the information highways.
- Guiding the development of the required standards, tools and services necessary for humanities and arts access.
- Making sure that the humanities and the arts are represented in the policy discussions pertaining to the further evolution of the national and global information infrastructure by building coalitions with organizations in other fields or sectors and by identifying policy issues.

To pursue these, the National Initiative expects to open a Washington office to coordinate the involvement of humanities and arts organizations in discussions, policy-making and demonstration projects bearing on the development of the National Information Infrastructure.

Like the Internet, the humanities and the arts have as a primary purpose making connections: between events, concepts, disciplines, institutions, and individuals. As a conceptual network, the humanities and the arts encompass multiple styles and perspectives; they interconnect memory and innovation, imagination and interpretation, knowledge and inspiration. The nation can justifiably celebrate the enrichment that the humanities and arts bring to the quality of its individual and community lives, and work with equal enthusiasm to adopt the National Information Infrastructure as an extraordinary opportunity for the sharing, preservation, and enrichment of our cultural heritage.

Working Group Reports

The Technical Challenge for the Humanities and Arts

Summary

This report articulates the technical requirements for networking humanities and arts information. The needs of the humanities and arts often overlap those of the sciences, but their priorities and emphases are for the most part different. The needs of the humanities and arts must also not be confused with the demands of entertainment and commerce. Although these needs may overlap (indeed may be synergistic in certain areas), the latter largely consist of broadcast transmissions requiring only passive involvement from the viewer, while the former require active participation and two-way and multi-way collaboration.

The recommendations of the Technical Requirements Working Group focus on the needs for specific items of technical support to serve creators and users of humanities and arts data, including artists and authors; students of the humanities and arts, from scholars to schoolchildren; and the general public.

If these requirements are not addressed at the outset of NII planning, the NII's full potential will not be realized. In the humanities and arts, it will be necessary to:

1) Guide standards as they evolve to ensure that humanities and arts information will retain its quality and remain viable over time.

2) Encourage the development of appropriate new tools and methods of knowledge representation, as well as shareable libraries of software tools.

3) Establish ways to connect holders and creators of the cultural heritage with those seeking access to it, through interactive, multivalent, collaborative communication and protection of intellectual property, so that creators can be consumers and consumers can become providers.

4) Foster international cooperation, particularly with respect to access to cultural heritage information across international boundaries.

Report of the Working Group on Technical Requirements

As has often been quoted, John Adams wrote that he studied war and diplomacy so that his children could study commerce and agriculture, and their children could study art and poetry. It is now time for the evolving Internet to move from its military, scientific and commercial stages to become a means for individuals throughout the country to create, communicate and participate in their culture. Choices being made today regarding the NII

will affect the representation, storage, distribution and use of humanities information as it applies to nearly all areas of life, including university teaching and scholarship, K-12 education and life enrichment for the general public.

The humanities and arts depend on representations of texts, artifacts and performances. In the future, it will be possible to store and transmit reproductions of all texts and forms of expression as digital data. Subsequent digital reproductions, made from digital data, could be accomplished without degradation, provided the proper compression algorithms are used. (Some compression algorithms that are commonly used in the entertainment and communications industries would not be acceptable for humanities and arts data.) Electronic media and tools will make it possible to create new forms of art in electronic modes. Given the ability to access and manipulate remote archives of digital materials, passive viewers can be turned into active participants and creators.

Knowledge in the humanities depends on access to a huge range of cultural evidence distributed around the world, and on the communication of ideas and the expression of opinions. Specialists and the general public may make different uses of this knowledge and engage in different discussions, but both need to be able to retrieve relevant texts, images, and sound, to link them meaningfully, and to append their own views. A distributed cultural heritage knowledge-base is essential if the humanities and arts are to flourish in the networked environment.

The humanities and arts have particular characteristics that impose special technical requirements, or particular priorities for general technical requirements. These can be classified into three main categories. First, the character of the NII will be inescapably shaped by how cultural materials are represented, how they can be viewed, and the ways in which they can be manipulated. Because in the humanities and arts texts and artifacts are often the object of study in themselves, representations must retain the essential qualities of the original: for example, high fidelity in sound and image, and original layouts and typography in text. Representations must enable scholars to endow objects with logical structures, analyze linguistic characteristics, and identify shifts in perspectives or views. For a universe of objects as old and as widespread as human civilization, layered representations of original objects and their interpretation are required to gain new access from a variety of intellectual perspectives. Humanists and artists require access at a fine grain of detail (whether in a single frame of film or a stanza of poetry) and from many points of entry. They need to view a work in multiple versions and to contextualize, index and present it in new ways.

Second, the humanities and arts are deeply concerned with the contextual significance of the objects under study. A researcher needs, along with the object, the context in which it was created, used, traded or worshipped. Past commentary and analysis, in many languages (and therefore character sets), is vital to understanding. Humanities scholars demand of the

information they use a simultaneous precision of reference and preservation of context that cannot be satisfied by retrieving items of information in isolation.

Third, the humanities and arts user is an active shaper of objects of study, creating new objects in the process of transformation. The artist, musician or writer fashions from the cultural fabric new works that draw on a vast cultural memory. To craft works from and responses to our cultural heritage, one needs open systems, widely accepted standards, access to collaborative workspaces and tools, and new methods of knowledge representation.

Recommendations of the Working Group

The humanities and arts give high priority to the following specific technical issues:

1) Guide evolving standards

One of the barriers to the creation and use of essential electronic archives is the absence of standards for capturing, documenting and preserving humanities and arts information. Standards in the digital world are continuously evolving: archives must survive in an environment that mingles working with evolving standards. Nevertheless, it is vital that such *de facto* and *de jure* standards are able to:

- Enable the highest fidelity of representation of originals so that distant users and future generations have access to resources that are worthy of study.
- Preserve integrity through technical methods such as color matching and compensation, preservation of special character sets, and document authentication (all of which require further development).
- Ensure survival over time. Encoding, representation and compression standards, when developed, must be maintained; and material will need to migrate through future standards as these evolve.
- Support rich documentation of object provenance, history of versions and modifications, and history of use of documents and artifacts. The provision of multiple representations and versions is especially crucial. For example, a play is both text and performance: the Zeffirelli film and videotaped Royal Shakespeare Company performance of a Shakespeare play are as importantly different as are the many editions of the play.
- Support rich description of and commentary on objects and documents, their logical structure, and their components and relationships. This parallel "layer of text" must accommodate any kind of annotations, including commentary, results of tests, linkages between representations in several languages, and multimedia.

2) Encourage the development of new tools

Some of the major categories of new tools needed in humanities and arts computing are:

- Authoring tools and compositional environments that exploit networked resources and are suited to production, presentation and exploration of content.
- Collaboration tools and systems for sharing workspace and creative environments.
- Tools for archiving objects, versions and derivations.

The tools required for creating, representing, storing, retrieving and comparing cultural information should be able to:

- Capture text, image and sound and its editing and mark-up while capturing the history of different versions.
- Annotate videoclips, images, oral interviews, music, dance and other cultural heritage information.
- Support annotation systems that allow not only for personal commentary, but also for additions to the cumulative scholarly record.
- Modify documents and object representations by addition, deletion and revision while creating/preserving credit for creation or authorship, and preserving an historic audit trail for reasons of provenance.
- Link versions, editions in foreign languages, and commentaries with the objects of commentary.
- Navigate through vast amounts of diverse and complex verbal, visual and aural information.
- Retrieve using a variety of intellectual perspectives by means of tools that go beyond keyword/Boolean searches to exploit image and voice recognition, or natural language processing.

At present very little funding supports the development of tools that meet the particular needs of the humanities and the arts. We strongly urge organizations in the public and private sectors to develop such tools, maintain shared libraries of software tools, and train as many people as possible in their use.

3) Support open and equitable access

Because culture is universal and cultural heritage is therefore of general interest, knowledge of the achievements of our culture should be widely accessible to people not only in museums, libraries, and schools, but also in offices and homes.

To satisfy this requirement, the NII must be an open system with full access to all citizens. Culture is not an abstraction; it essential to the quality of life. The NII will be the 21st century's primary medium for disseminating our culture. The goal of the humanities and the arts on the NII is to create dialogue among individuals and communities employing original texts, high-resolution images, video, music and speech. This requires multivalent access in which everyone may be a creator and consumer, and many individuals may collaborate or debate simultaneously. A successful NII would allow students to read source texts and incorporate them into new documents, view representations of art and directly create or disseminate derivative or new works, hear a debate and comment directly on the various points of view. A successful NII could enable interested citizens to explore their cultural heritage through searching genealogical databases, seeing images of ancestral home towns, hearing music their grandparents enjoyed or even composed, and entering into discussions with others who share their interests. To satisfy these requirements the NII must be truly multidimensional and fully interactive.

Content needs to be accessible. Institutions holding public collections of source materials in the arts and humanities or dedicated to the documentation of our cultural heritage must be connected to the NII and be helped to provide access to the knowledge stored in their holdings. Substantial funds will be required to enable archives, performing arts centers, libraries, galleries and museums to mount servers on the networks and maintain systems and quality controls required for a "logical archive" of distributed cultural resources. Even if content is captured and connected to the networks, mechanisms for assuring protection of intellectual property and enabling potential users to easily license parts of intellectual property for re-use are essential. A variety of mechanisms which provide for appropriate protection of intellectual property rights, and for ease of access to resources and their subsequent use, need to be tested in the near future. In each case, the needs of humanities and arts for the use of very small portions of larger works, as well as works in their entirety, must be recognized.

4) Foster international cooperation

The development of technology and tools to support access to, and use of, cultural heritage information for the humanities and arts cannot be pursued by nations in isolation. From the outset cooperation in both standards and technology development must be international. Not only are the primary resources required by arts and humanities international in scope and distribution, but the dialogue in which humanists and artists are

engaged is necessarily multinational. Government will be required to ensure that no restrictions are imposed on the flow of cultural data across borders. The establishment of sizable, international, public-domain test databases to encourage the development, testing and evaluation of tools would contribute greatly to demonstrating the desirability of humanities and arts information on the NII and to the evolution of standards and tools.

Conclusion

The humanities and arts require investment in the technologies that will permit consistent, reliable and widespread digital representation of our cultural heritage and enable that resource to be exploited with ease. This in turn requires understanding of the special characteristics of humanities and arts information (which demands precision of reference, preservation of context, and multiplicity of viewpoints) and appreciation of the barriers to its access (including connectivity of institutions holding such information, methods for protecting intellectual property, and open systems).

Technological research and development is required to resolve some of these issues. Many of these needs can be addressed if funding is forthcoming from public and private sources to develop appropriate standards and tools. Additional support will be required to capture the vast cultural heritage resources and provide the public with mediated access.

Appropriate policy frameworks will also assist in satisfying some of these objectives. The NII should foster the production, transmission and manipulation of cultural heritage resources provided by diverse communities. It must not foreclose future options. It must use the standards process to ensure that it will be extensible and open. It must proceed with international cooperation, and it must strive to provide global access.

Investing in Humanities and Arts Information Resources

Summary

The humanities and the arts must be represented on the nation's electronic highways not only because they serve as the repository of our civilized values, but also - from a more pragmatic perspective - because they are the producers of the intellectual property that will be one of the nation's most valuable economic resources in the new information economy.

These recommendations of the Electronic Resources Working Group concern the development of critical capabilities and resources that are necessary for the humanities and the arts to participate fully in the electronic environment. They focus on the policies, intellectual commitments and financial support necessary to amass comprehensive electronic data resources. This information content is crucial for the humanities and the arts to serve the highly diverse members of their potential public.

The group's recommendations state that it will be necessary to:

1) Build a critical mass of digitized and networked information in the humanities and the arts.

2) Encourage a public/private partnership to encourage the humanities and the arts' unique potential for developing collaborative space in the networked environment.

3) Attract enough public and private funds to build the resources needed.

4) Secure representation in strategic national decision-making forums.

Although the scientific, technological and economic value of the information revolution has become increasingly apparent to the public, so far the equally significant contributions of the humanities and the arts to this revolution have remained less well known. But far from being merely the documenters, commentators and decorators of our existence, historians, humanities scholars and artists are among the essential guardians of civilization and the human spirit. To quote John Ruskin, "Art represents a social necessity that no nation can neglect without endangering its intellectual existence."

In fact, the humanities and the arts constitute significant intellectual property interests in the new information economy, where information and intellectual property will be one of the nation's most valuable economic resources. The Clinton administration has recognized that the information highway can "empower citizens and help reinvigorate [our] public institutions," and "will create unprecedented opportunities and new challenges for our arts and cultural industries." (National Institute for Standards and Technology, *Putting the Information Infrastructure to Work*, Vol. 1, May 1993; and Vice President Gore's statement to the International Artist's Rights Symposium, April, 28 1994).

The initial phases of the establishment of a national information infrastructure have largely focused on technology: equipment, interconnectivity and access. Great strides have been made in these areas, and further refinements and advances will continue as we build upon this foundation and learn from experience. Now, the focus must turn to content. It is in this growing concern for content, and the technical challenges it entails, that the humanities and the arts present new opportunities to the future course of the information revolution.

Recommendations of the Working Group

The Working Group on Electronic Resources established that, to meet those challenges, it will be necessary to:

1) **Build a significant mass of digitized and networked information in the humanities and the arts**

A rich variety of projects developing electronic databases, publications, software tools, services and communication systems in the humanities and the arts has begun, some of them through substantial private-sector initiative and effort. Nevertheless, these projects merely hint at the range and scope of what needs to be done to accumulate the comprehensive data necessary if the nation is to realize the potential contribution of the humanities and the arts in the information age.

Achieving such a critical mass of digitized information will require a significant expansion of the number and type of data conversion and data creation projects undertaken so far. Greater investment in the development of additional and more powerful tools would encourage collaborative work, improve the ability to retrieve data, and make possible the creative manipulation of complex multimedia information. Agreement must be reached on standards for describing and encoding images and text, on extending the protocols of peer review and validation to the networked environment, and on issues of copyright, privacy and access.

If the current litter of autonomous projects is to evolve into the building blocks of national data sets in the humanities and the arts, the federal government must work with representatives of the humanities and the arts to clarify priorities and articulate a plan of action. The federal government has given impetus and focus to complex scientific ventures; it should now join with humanities scholars and artists to develop equally ambitious goals for the electronic conservation of and access to our cultural heritage.

2) Encourage a public/private partnership for developing the potential of collaborative space in the networked environment

A networked environment can help bridge the gap between the knowledge of experts and that of ordinary individuals, which will ultimately result in a better-informed and more engaged citizenry. It can help mobilize specialized knowledge to solve public problems. In a networked environment there is room for many voices and viewpoints, many different types of publication and attribution, and different levels of privacy and control. Unique information resources can be shared simultaneously, repeatedly and quickly, at low cost.

The scope, complexity and contextually sensitive character of much activity in the humanities and the arts require a public/private commitment to further research and development aimed at achieving the interactive potential of networked space. More sophisticated electronic tools and communication methods will help the humanities and the arts to re-invent a networked commons for public debate in our modern, multicultural society.

3) Attract the necessary public and private funding

As mentioned above, the humanities and the arts face the formidable task of accumulating the critical mass of electronic information that will allow them to participate fully in the networked environment in meaningful and creative ways. The process of converting extensive and historic information resources from other media and formats into digitized form has only just begun, and the process of developing adequate storage, retrieval and manipulation tools for complex multimedia information is still in its infancy. The

marketplace is unlikely to provide the financial resources required for these tasks; instead, the combined investment of public and private funds will be necessary.

It is time for the federal government to provide financial support for building electronic information capacity in the humanities and arts that is comparable to what is now devoted to projects in the sciences. Currently, the Human Genome Project and the Global Climate Change and Biological Diversity initiatives receive substantial support from the federal government for the creation of national data sets in the sciences. Our cultural heritage needs similar support to function effectively in the coming age of networked information.

In addition to federal support earmarked for developing the networked infrastructure for cultural heritage, the humanities and the arts should be not only eligible but also motivated to compete for support for other projects concerned with information technology. For example, software development projects sponsored by the National Institute for Standards and Technology (NIST), Department of Commerce programs like the National Information Infrastructure Applied Projects, as well as the Digital Library Initiative jointly supported by the NSF, Advanced Research Projects Agency (ARPA), and National Aeronautics and Space Administration (NASA), should encourage representatives from the humanities and the arts to submit applications and include appropriate authorities in their awards committees.

4) Secure representation in strategic national decision-making forums

The humanities and the arts constitute significant intellectual property interests in the new information economy. Their educational, social, and cultural resources merit a voice in government forums. As information technology initiatives spread through government and society, representatives of the humanities and the arts should be included at strategic policy discussions. Not only is this the democratically appropriate course of action, but it is in the public's interest to include humanistic and artistic perspectives in decisions that will affect all of our lives in the coming century.

The federal government should invite representatives of the humanities and the arts to participate in all advisory and decision-making bodies debating information technology issues, such as the peer review panels of agencies as diverse as the NIST, the High Performance Computing and Communications Initiative, the NSF Computing and Engineering directorate, and joint ventures such as the NSF/ARPA/NASA (as well as NEH and NEA) digital library initiatives. Representatives from the humanities and the arts should also participate in the deliberations of such entities as the NII Task Forces; the Office of Science and Technology Policy; the Federal Coordinating Council for Science, Engineering and Technology; the Office of Information and Regulatory Affairs in the Office of Management and Budget; the Federal Communications Commission; the National Telecommunications and Information Administration (NTIA); and various committees and working groups of the Commerce Department-headed Interagency Information Task Force

(IITF), especially the Advisory Council on the NII, the Telecommunications Policy Committee and the Information Policy Committee, specifically its Working Group on Intellectual Property.

Conclusion

The humanities and the arts can bring significant cultural capital and informational assets to the networked environment. However, much must be done if they are to continue to fulfill their historic missions in the new electronic era. Certainly, the cultural heritage fields must enjoy approximate parity with the financial and policy opportunities accorded the electronic information capacities developing in other areas, such as the sciences, finance and economics, law, media and public opinion, and medicine. Both public and private funding and effort must be committed to incorporating our cultural heritage into the National Information Infrastructure. Professional associations in the humanities and the arts also have a critical role to play in these efforts.

Appendices

Appendix A

Important Computer-Based Projects in the Humanities and Arts

During the discussion of the Working Group on Electronic Resources, participants alluded to a number of projects and products in order to illustrate points about needs and achievements in the humanities and arts. These projects were considered to be in some way exemplary, but the compilation of examples in no way provides a comprehensive survey or even ensures that the "best" project in any category was cited. This list is simply a collection of projects put forward at the meeting, and does not in any sense serve as a resource directory.

Archives/Collections
Addison Gallery of American Art
Cleopatra Project
Dallas Museum of Art
Heinz Project, Carnegie Mellon University
Inter-University Consortium for Political and Social Research (ICPSR)
The Labyrinth
Leonard Bernstein Archives Project
Library of Congress Global Electronic Library
MIT Museum Architecture Project
The Making of America: 1860 - 1960
UNC/SO. Historical WWW (Folk Music Archives)

Bibliographies/Reference Works
Association for American University Presses (AAUP) Catalogs Project
Avery Index to Architectural Periodicals
Bibliography of the History of Art (BHA)
Colorado Association of Research Libraries (CARL)
DIALOG Information Services, Inc.
Eighteenth-Century Short Title Catalogue (ESTC)
ELISE
Humanities Computing Yearbook
The Inventories of American Painting and Sculpture at the National Museum of American Art
IRCAM Music Resources
LEXIS
MLA Bibliography
Online Computer Library Center (OCLC)
Out
Oxford English Dictionary (OED)
Provenance Documentation Collaborative
International Repertory of the Literature of Art (RILA) Bibliography
Research Libraries Information Network (RLIN)
RISM
Save Outdoor Sculpture Project
Scipio
Witt Computer Index of Print Works (UMI)

Conference/Collaborative Facilities
Arts Wire
ArtsEdge
BreadNet
The Electronic Peirce Consortium (EPC)
FineArt Forum
H-NET
High-Pitched Voices
Humanist
The Institute for Advanced Technology in the Humanities (IATH-L)
Invent-L (Invention List)
MUSEUM-L
National Geographic Society Kids Network
PacerForum
Whole Earth 'Lectronic Link (The WELL)

Courseware
Alberta Education Sightlines
FLAME
Dans le Quartier St. Gervais
Direction Paris
National Geographic Society G-TV
Our Shakespeares
Who Built America?

Directories
ArtSource
Catalogue of Projects in Electronic Text (CPET)
Census of Antique Art and Architecture Known to the Renaissance
Computing in Musicology, An International Directory of Applications
An Electronic Inventory of Humanities Data Sets
FineArt Forum Directory of Online Resources
Project on International Communications (PICS)
VARIATIONS Project

Electronic Publications
APA Preprints
Directory of Electronic Journals and Newsletters
E-Journal
E-Journal of Virtual Culture
Global Jukebox
Journal of Postmodern Culture
J-STORE
Leonardo Electronic Almanac (LEA)
Poet-L
Project Janus
Questel
Reviews of American History

Exhibits
An Exhibition of Fossil Life
Rome Reborn: The Vatican Library and Renaissance Culture
The Soviet Archive Exhibit
Virtual Tour of the Louvre

Imagebases/Knowledge-bases
American Memory Project
Artserve
AVIADOR Project
A New Edition of the Canaanite Texts From Ugarit
The First Emperor (China)
Global Jewish Database
Macmillan Encyclopedia of the Holocaust
Medieval and Early Modern Data Bank
National Library of Medicine (NLM) History of Medicine
National Moving Image Database (NAMID)
Perseus Project
Shakespeare Interactive Archive Project
Wexner Learning Center at the U.S. Holocaust Memorial Museum

Multi-Institutional Collaboratives/Experiments
Brittle Books Program
Canadian Heritage Information Network (CHIN)Center for Electronic Texts in the Humanities (CETH)
Digital Image Access Project
INFOBITS
The MUSE Project: Electronic Access to Museum Collections for Research and Education
NOUS
PONG
The University Licensing Project (TULIP)

Software
Annotext
Authority Reference Tool (ART)
Center for Educational Computing Initiatives (MIT/CECI)
Eudora
Gophers
KLEIO
Micro-OCP
Mosaic
Operative Term is Stimulate (OTIS)
Pisa Lexical Database
Serial Line Internet Protocol (SLIP)
Storyspace
Système D
Textual Analysis Computing Tools (TACT)
Threaded Newsreaders
TU-STEP

Standards/Standard Setting Projects
Art Information Task Force (AITF)
CNI-Z39.50 Gateway
Computer Interchange of Museum Information (CIMI)
Imaging Initiative
MAIL STANDARTS (MIME)
Standard Generalized Markup Language (SGML)
Text Encoding Initiative (TEI)

Textbases

American Founding Fathers Project
American and French Research on the Treasury of the French Language (ARTFL)
Canterbury Tales Project
The Charette Database
Dartmouth Dante Project
Durkheim Full-Text Database
The Kolb-Proust Archive
Network of European Reference Corpora (NERC)
NEXIS
Oxford Text Archive
Project Muse (Johns Hopkins University)
Thesaurus Linguae Graecae (TLG)
Women Writers Project

Thesauri/Vocabularies

Art and Architecture Thesaurus (AAT)
Thesaurus of Geographic Names (TGN)
Thesaurus Musicarum Latinarum (TLM)
Union List of Artist Names (ULAN)

Appendix B

Sponsors of the National Initiative

The Getty Art History Information Program

The Getty Art History Information Program (AHIP), one of six operating programs of the J. Paul Getty Trust, seeks to make art-historical information more accessible to scholars and researchers through the use of advanced computer technology. It does so by promoting common perspectives and standards among international institutions and organizations on projects in four general areas: working to affect policies that will enhance access to electronic information; coordinating vocabularies to facilitate consistent data entry and retrieval; providing bibliographic services; and assembling art historical databases. Among AHIP's projects are the Art & Architecture Thesaurus, the Art Information Task Force, the Image and Information Standards Initiative, the Bibliography of the History of Art, the Avery Index to Architectural Periodicals, the Provenance Documentation Collaborative, the Witt Computer Index, the Union List of Artist Names, and the Thesaurus of Geographic Names. The Getty Art History Information Program, Director, Eleanor Fink, 401 Wilshire Boulevard, Suite 1100, Santa Monica, California 90401-1455, (310) 395-1025, ext 1164, (310) 451-5570 fax, e-mail: efink@getty.edu

The American Council of Learned Societies

The American Council of Learned Societies (ACLS) is a private non-profit federation of 52 national scholarly organizations. The purpose of the Council, as set forth in its constitution, is "the advancement of humanistic studies and the maintenance and strengthening of relations among the national societies devoted to such studies." Included in the program of the Council are awards to individual scholars to advance research in the humanities and humanistic aspects of the social sciences, support for international scholarly research and exchanges; activities concerned with the identification of present and future needs of humanistic scholarship, and planning and development to meet these needs; and organizational functions. In addition, the Council has fiscal and administrative oversight for the Council for International Exchange of Scholars (CIES), which administers the Fulbright program. Organized in 1919 and incorporated in the District of Columbia in 1924, the ACLS was granted a federal charter through the United States Congress in 1982. The American Council of Learned Societies, President, Stanley Katz, 228 East 45th Street, New York, NY 10017-3398, (212) 697-1505, (212) 948-8058 fax, e-mail: snkatz@pucc.princeton.edu

The Coalition for Networked Information

The Coalition for Networked Information was founded in March 1990 to help realize the promise of advanced networks and high-performance computing for information access and delivery. The Coalition was established by three associations: The Association of Research Libraries (ARL), CAUSE and EDUCOM. ARL is an association promoting equitable access and effective use of recorded knowledge supporting teaching, research and scholarship. CAUSE and EDUCOM are dedicated to introducing, using

and managing information technology and related sources in research in general and higher education. The Coalition for Networked Information promotes the creation of access to information resources in networked environments in order to enrich scholarship and enhance intellectual productivity.

A Task Force of institutions and organizations able and willing to contribute resources and attention to the mission of the Coalition was created in 1990 and continues to grow. This Task Force now provides a common vehicle by which nearly 170 institutions and organizations pursue a shared vision of information management and how it must change in the 1990s to meet the social, educational and economic opportunities and challenges of the 21st century. Members of the Task Force include higher education institutions, publishers, network service providers, computer hardware, software, and systems companies, library networks and organizations, and public and state libraries. The Coalition for Networked Information, Executive Director, Paul Evan Peters, 1527 New Hampshire Avenue, N.W., Washington, D.C. 20036, (202) 232-2466, (202) 462-7849 fax, e-mail: paul@cni.org

Appendix C

Working Group on Technical Requirements

- *Chair*, Stuart Lynn, formerly Vice President for Information Technologies, Cornell University, and currently President, Commission on Preservation and Access
- *Group Report Writer*, Michael Lesk, Division Manager of Computer Science Research, Bell Communications Research
- *Group Report Writer*, Judi Moline, Computer Scientist and Project Director, National Institute for Standards and Technology
- *Group Report Writer*, Nancy Ide, President, Association for Computers and the Humanities
- David Bantz, Director of Academic & Public Computing, University of Chicago
- Charles Henry, Director of Libraries, Vassar College, and Coalition for Networked Information
- Rick Holt, Senior Vice President, Electronic Publishing Systems, On Line Computer Systems, Inc.
- Charles B. Lowry, University Librarian, Carnegie Mellon University
- Clifford Lynch, Director of Library Automation, University of California
- Barbara Morgan, Director of Advanced Technology Planning, University of California, Berkeley
- Janet Murray, Director, Laboratory for Advanced Technology in the Humanities, Massachusetts Institute of Technology
- Ben Schneiderman, Professor, Computer Science and Head, Human-Computing Interaction Laboratory, University of Maryland
- Susan Siegfried, Research Projects Manager, Getty Art History Information Program
- C. Michael Sperberg-McQueen, Senior Research Programmer, Academic Computer Center, University of Illinois at Chicago
- Ronald Weissman, Director of Strategic Marketing, NeXT Computer, Inc.

Appendix D

Working Group on Electronic Resources

- *Chair*, Czeslaw Jan Grycz, Coordinator, Scholarship and Technology Study Project, University of California
- *Profile and Group Report Writer*, Margaret Wyszomirski, Senior Research Fellow, Graduate Public Policy Program, Georgetown University
- Sandra Braman, Resident Assistant Professor in the Institute of Communications Research, University of Illinois at Champaign-Urbana
- Joseph Busch, Acting Program Manager, Standards and Research Projects, Getty Art History Information Program
- Ben Davis, Research Associate, Center for Educational Computing Initiatives, Massachusetts Institute of Technology
- David Fenske, Head, Music Library, School of Music, Indiana University
- Lisa Freeman, Director, University of Minnesota Press
- Douglas Greenberg, President and Director, Chicago Historical Society
- Vicki Hancock, Assistant Director, Education and Technology Resources Center, Association for Supervision and Curriculum Development
- Charles Henry, Director of Libraries, Vassar College, and Coalition for Networked Information
- Susan Hockey, Director, Center for Electronic Texts in the Humanities, Rutgers University
- Bettina Huber, Director of Research, Modern Language Association of America
- Richard Jensen, Executive Director, H-NET, and Professor of History, University of Illinois at Chicago
- Robert Alun Jones, Professor of Sociology, History and Religious Studies, and Director, Advanced Information Technologies Laboratory, University of Illinois
- Michael Joyce, Associate Professor of English, Vassar College
- Stanley Katz, President, American Council of Learned Societies
- Richard Loveless, Director, Institute for Studies in the Arts, Arizona State University
- Paul Mangiafico, Humanities Computing Specialist, Center for Text and Technology, Academic Computer Center, Georgetown University
- Patricia McClung, Director, Member Support and Services, The Research Libraries Group, Inc.

- Elli Mylonas, Lead Project Analyst, Scholarly Technology Group, Brown University
- David Perry, Editor, University of North Carolina Press
- Marilyn Schmitt, Program Manager, Issues and Policy, Getty Art History Information Program
- Susan Siegfried, Research Projects Manager, Getty Art History Information Program
- John Stokes, President, Stokes Imaging Services

Appendix E

Advisory Meeting Participants
Washington, D.C., July 14, 1994

Sponsoring Organizations:

Getty Art History Information Program
Eleanor Fink, Director

American Council of Learned Societies
Stanley Katz, President

The Coalition for Networked Information
Paul Evan Peters, Executive Director

Executive Committee:

American Council of Learned Societies
Stanley Katz, President
Douglas C. Bennett, Vice President

The Coalition for Networked Information
Charles Henry, *Co-Chair, National Initiative,* and Director of Libraries, Vassar College
Peter Lyman, Dean and Librarian, Dean's Office, University of Southern California

Getty Art History Information Program
Marilyn Schmitt, Program Manager, Issues and Policy
Susan Siegfried, *Co-Chair, National Initiative*, and Research Projects Manager, Issues and Policy

Participating Organizations:

American Arts Alliance
Pamela Kulik, Grass Roots/Legislative Associate

American Association of Museums
Michael Roark, Manager of Government and Public Affairs
Patricia Williams, Deputy Executive Director, Programs and Policies

American Association of University Presses
Peter Grenquist, Executive Director

American Library Association
Peggy Barber, Associate Executive Director of Communications and Development

Arts Wire
David Green, Director of Communications

Archives and Museum Informatics
David Bearman, Editor

Association of American Universities
John Vaughn, Director of Federal Relations

Association of Art Museum Directors
Maxwell Anderson, Director

Association of Research Libraries
Duane Webster, Executive Director

College Art Association
Susan Ball, Executive Director

Commission on Preservation and Access
Hans Rutimann, International Program Officer

Nathan Cummings Foundation
Joan Shigekawa, Director of Arts Programs
Jennifer McCarthy, Director of Special Projects

Executive Office of the President
David Lytel, Information Infrastructure Specialist

Federation of State Humanities Councils
Jamil Zainaldin, President

Institute of Museum Services
Diane Frankel, Director

John F. Kennedy Center
Scott D. Stoner, Director, ArtsEdge

Library of Congress
Deanna Marcum, Director for Public Service & Collection Management

Literary Organization of Online Programs
Jim Sitter, Project Coordinator, Executive Director

Andrew W. Mellon Foundation
Richard Ekman, Secretary

Modern Language Association
Phyllis Franklin, Executive Director

Museum Computer Network
Diane Zorich, President

National Archives and Records Administration
Trudy Peterson, Acting Archivist

National Assembly of Local Arts Agencies
Robert Lynch, President
Mara Walker, Acting Director of Program and Member Services

National Association of Artists Organizations
Helen Brunner, Executive Director

National Endowment for the Arts
Olive Mosier, Director, Office of Policy, Planning, and Research
Karen Christensen, General Counsel

National Endowment for the Humanities
Martha Chowning, Special Assistant to the Chairman
George Farr, Director of Preservation and Access

National Gallery of Art
Earl Powell III, Director
Robin Dowden, Database Administrator

National Humanities Alliance
John Hammer, Director

National Science Foundation
Allan Kornberg, Division Director, Social, Behavioral and Economic Sciences

Online Computer Library Center, Inc.
Lee Donne Olvey, Vice President and Assistant to the President

President's Committee on the Arts and the Humanities
Malcolm Richardson, Deputy Director

Rockefeller Foundation
Clifford Chanin, Associate Director, Arts and Humanities Division
Tim Gunn, Executive Director, National Video Resources